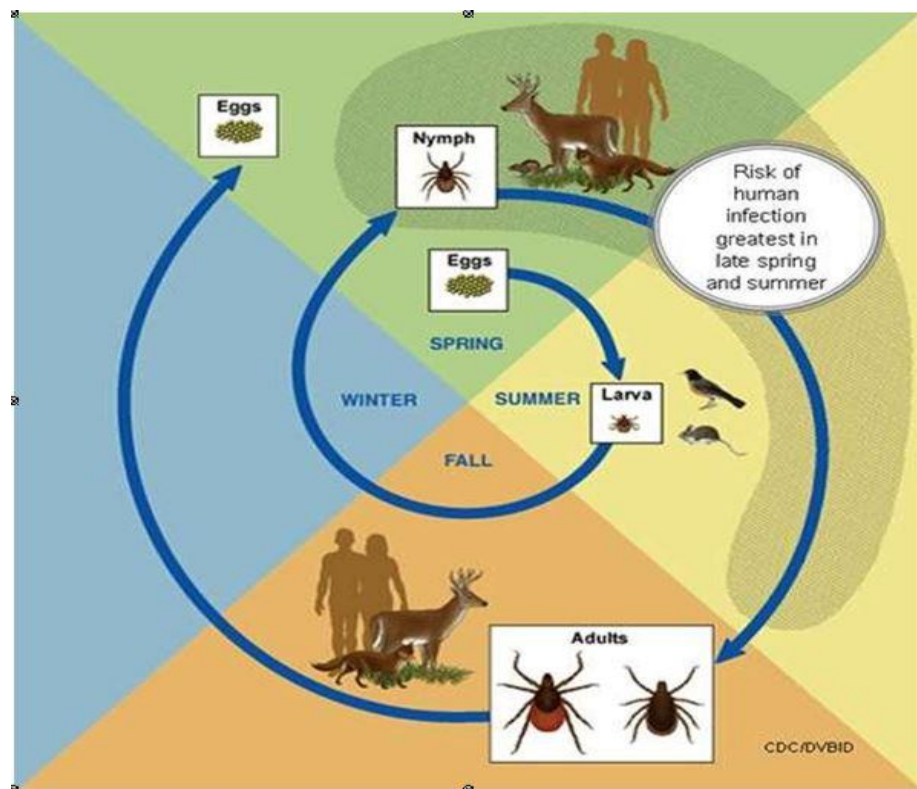


# Ticks

## General Tick Biology

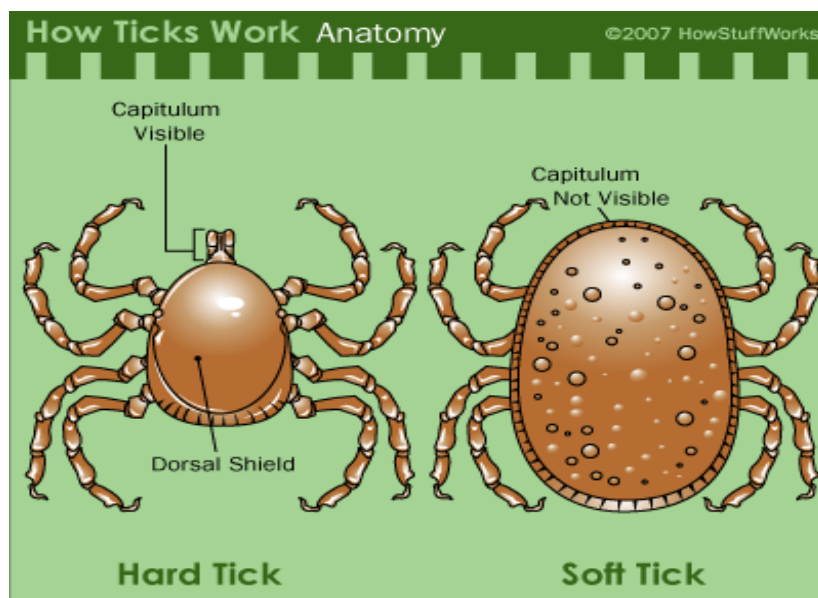
- Life cycle has 4 stages: egg, 6-legged larvae, 8-legged nymph, & adult
- Must consume blood from a host at every stage to develop – each stage must find a new host
- Pierces skin and attaches to host with mouthparts
- Feed on mammals, birds, & lizards
- Larvae & nymphs prefer smaller hosts

## Life cycle



# Hard ticks vs Soft ticks

Feature	Hard Tick	Soft Tick
Scutum (dorsal shield)	Present	not present
Capitulum (mouth parts)	anterior, visible from above	ventral, not visible from above
Nymphal stages	One	Several
Adult feeding time	several days	30-60 min
Female blood meals	One	Several
Egg laying events	One	Several
Total eggs laid	3,000-8,000	400-500



# Harm to humans

## ◆ Direct injures

1. Irritation: sting, secondary infection, allergy
2. Tick paralysis: paralysis of the motor nerves --- cannot walk or stand, has difficulty in speaking, swallowing and breathing.

## ◆ Transmission of diseases

Three medically important tick species

- American dog tick
- Blacklegged tick or deer tick
- Lone star tick.



An erythema migrans (EM) rash should be reported to a doctor, as it may indicate Lyme disease.

## American Dog Tick: Diseases

- Carries Rocky Mountain spotted fever
- Can also transmit tularemia
- Injected dog tick saliva can cause tick paralysis (tick neurotoxin)
- Infected tick attached to host 4 – 6 hours before transmitting disease



## Blacklegged tick or deer tick

- Smaller than other ticks - males 1/16", females ~3/32"

- Both sexes are dark chocolate brown, but rear half of adult female is red or orange

- Larval stage is nearly translucent

- Engorged adult females are brownish

Carries Lyme disease

May also carry anaplasmosis & ehrlichiosis

Can infect a host with two or more diseases simultaneously

Infected tick attached to host 36 – 48 hours before disease transmission



### Lone star tick

- Adult female is  $\sim 3/16$ " long, brown with distinct silvery spot on upper scutum
- Male is  $\sim 3/16$ " long, brown with whitish markings along rear edge.
- Engorged female is almost circular &  $\sim 7/16$ " long



- All stages found throughout warm months
- Found in shady locations along roadsides, in meadows, grassy & shrubby habitats

- Prefers low growing vegetation
- Larval ticks (seed ticks)  
congregate in large numbers on vegetation
- Carries ehrlichiosis & southern tick-associated rash illness (STARI)
- May also transmit tularemia



**STARI rash**



**Tularemia ulcer**

- Infected tick attached to host several hours before transmitting disease



# Mites



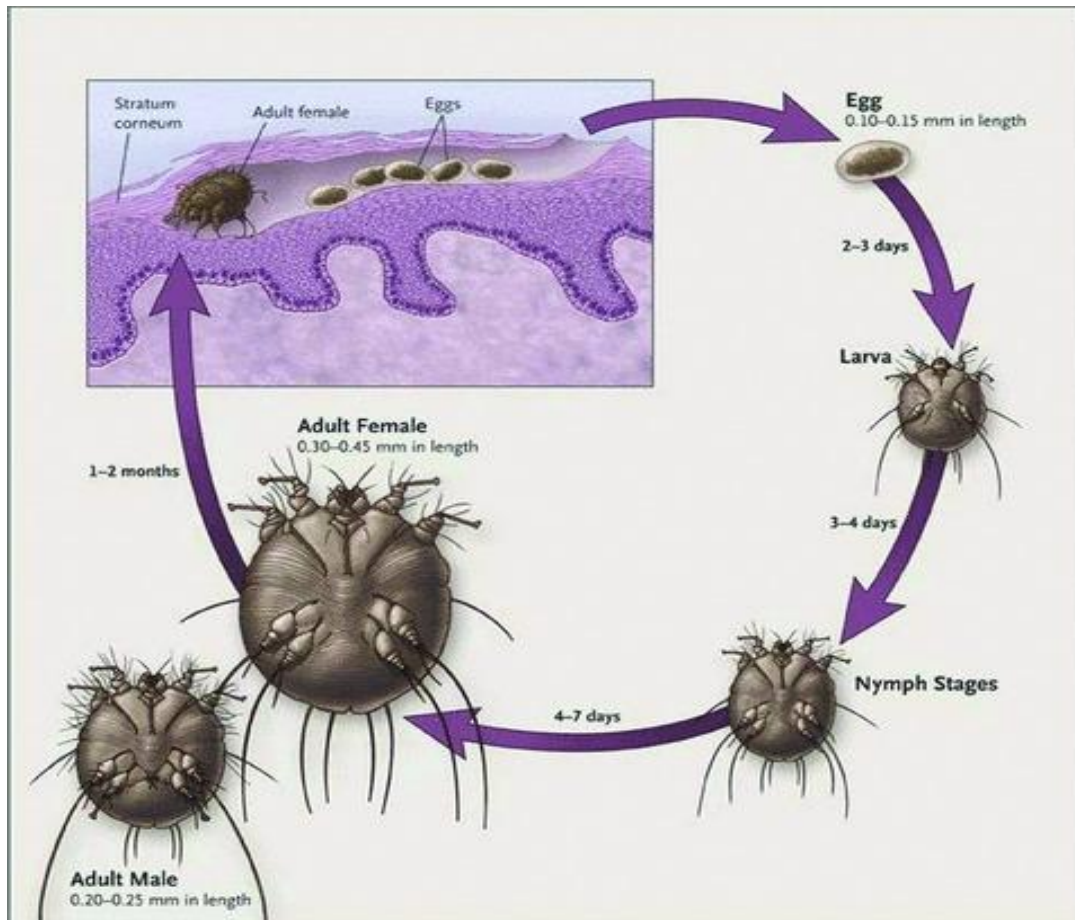
Mites are small arthropods belonging to the class Arachnida and the subclass Acari (also known as Acarina). Mites are characterized by the body being divided into two regions, the cephalothorax or prosoma (there is no separate head), and an opisthosoma.

Most mites are tiny, less than 1 mm (0.04 in) in length, and have a simple, unsegmented body plan. Their small size makes them easily overlooked; some species live in water, many live in soil as decomposers, while others again are predators or parasites. This last group includes the important scabies mite of humans. Most species are harmless to humans but a few are associated with allergies or may transmit diseases.

## Morphology

- Most have piercing/sucking mouthparts, some have chewing mouthparts. All are different from insects
- Most are 8-legged
- All are extremely tiny. A big one is the size of a period in your textbook. Some adults live inside hair follicles. Some live inside trachea of insects.

## Life cycle



## Mites of medical importance

- Acariasis - rare
- Allergies – extremely common
- Dermatitis
- Skin-Invading Mites (follicle, Sarcoptes)
- Disease Transmission

- Psychological Disorders

## House dust mites

Extremely common & prolific

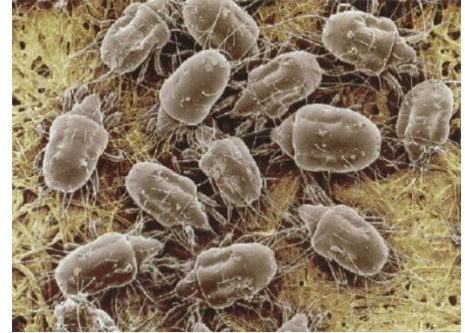
Body fragments & fecal material are allergens

Many products/services available allergy control

Many of these promote claims that have become urban legends:

### Pillow weight & HDM

Feather pillows are worse than synthetic – opposite is true



## Chiggers & dermatitis

- Mites in the family trombiculidae
- Pierce skin, suck fluid
- Only the 1<sup>st</sup> instar larvae feed on humans, other stadia are predators
- In our area, most common in late spring/early summer.
- Especially common near flower beds



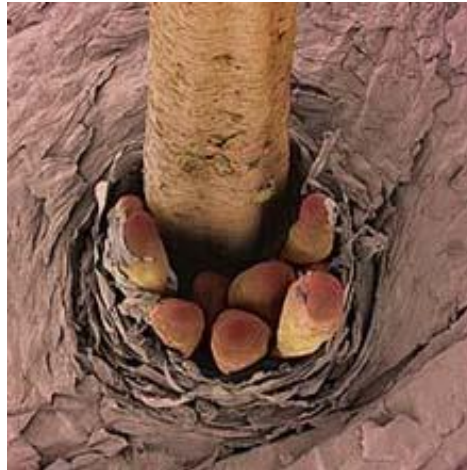
## Skin-invading follicle mite

- *Demodex* spp. mites.



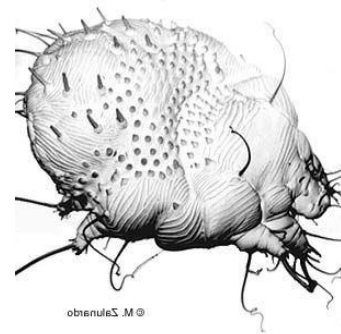


- Host specific – most common human species are *D. folliculorum* & *D. brevis*
- Lives in pores of hair follicles, esp. on the face in eyelashes
- Incidence increases with age



## Skin-invading sarcoptes

- *Sarcoptes scabiei* is the human scabies mite.
- Also cause mange in many animals.
- Clinical forms of scabies:



- Papular
- Bullous
- Nodular
- Crusted



## Pathogens transmitted by mites

### 1- Rickettsial pox

- Transmitted by house mouse mite
- A spotted fever rickettsia
  - Papule dries, becomes scab (eschar)
  - Generic systemic symptoms



### 2- Scrub Typhus (Tsutsugamushi)

- Transmitted by various chigger spp.
- Different spp. have different seasonal/geographic distributions.
- Chiggers themselves are reservoirs.

## Immune response in scabies

*S. scabiei* infestation results in inflammatory and adaptive immune responses relatively late in the infection (4–6 weeks after initial contact with mite). Given the parasite's long co-evolution with its hosts, it is believed scabies mites have developed the capability of modulating various aspects of the host immune responses resulting in the delayed onset of symptoms. The rash and itch associated with scabies shows features of both **type I (immediate) and type IV (delayed) hypersensitivity reactions**. The initial inflammatory response towards the

mite and its products consists of **Langerhans cells (LCs)** and **eosinophils** with smaller number of monocytes, macrophages and mast cells.

## Diagnosis, Prevention and control

- Symptoms: sinuous tracks in the skin, inflammation, itching.
- Find the mites in the skin.
- All clothing and bedding should be laundered.
- 5% Permethrin ointment.



## General protective measures against ticks & other arthropods

### **Avoid outbreaks**

To the extent possible, travelers should avoid known foci of epidemic disease transmission.

### **Be aware of peak exposure times and places**

Exposure to arthropod bites may be reduced if travelers modify their patterns or locations of activity. Although mosquitoes may bite at any time



of day, peak biting activity for vectors of some diseases (such as dengue, Zika, and chikungunya) is during daylight hours. Vectors of other diseases (such as malaria) are most active in twilight periods (dawn and dusk) or in the evening after dark.

### **Wear appropriate clothing**

Travelers can minimize areas of exposed skin by wearing long-sleeved shirts, long pants,

boots, and hats. Tucking in shirts, tucking pants into socks, and wearing closed shoes instead of sandals may reduce risk.



### **Check for ticks**

Travelers should inspect themselves and their clothing for ticks during outdoor activity and at the end of the day. Prompt removal of attached ticks can prevent some infections. Showering within 2 hours of being in a tick-infested area reduces the risk of some tick-borne diseases.



### **Bed nets**

When accommodations are not adequately screened or air conditioned, bed nets are essential in providing protection and reducing discomfort caused by biting insects.



## **Insecticides and spatial repellents**

More spatial repellent products are becoming commercially available. These products, containing active ingredients such as metofluthrin and allethrin, augment aerosol insecticide sprays, vaporizing mats, and mosquito coils that have been available for some time. Such products can help to clear rooms or areas of mosquitoes (spray aerosols) or repel mosquitoes from a circumscribed area (coils, spatial repellents).



## **Protective measures against bed bugs**

Inspect the premises of hotels or other sleeping locations for bed bugs, and keep suitcases closed when they are not in use and try to keep them off the floor, also keep in mind that bed bug eggs and nymphs are very small and can be easily overlooked.

